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MISCELLANEOUS INSECTS OF 1925.

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In the Annual Report on the Entomological Division for 1925, only the more important injurious insects were mentioned and it was there stated that owing to the large number of observations on insects recorded during the year, it was considered to be impracticable to embody them in an annual report and that an additional report should be compiled during 1926. This publication should therefore be considered as a supplement to the annual report. It has been written essentially to give planters and others an idea of the insects likely to occur on various plants. A brief description of the appearance of the stage of the insect causing the injury, the part of the plant attacked and the name of the host plants are given.

One of the chief investigations of this Division during 1925 was the collection of insects which were found feeding on plants of economic importance and recording observations concerning their habits and life-histories. In connection with this work about 1040 batches, representing some 6000 insects, passed through the breeding cages. It will be readily seen that this report deals with only a few of these insects. A large number has been omitted because their identification has not been received, others because the observation merely records the host plant and yet others, for instance, the Red-stripe weevil (*Rhynchophorus schach*, Oliv.) and the Black or Rhinoceros beetle (*Oryctes rhinoceros*, L.), have not been mentioned, because the habits and control should be known to those who are interested.

The report has been divided into various sections, but since some insects attack plants in more than one group, a plant index has been prepared to facilitate reference.

It might be mentioned that Bulletin No. 38 on a "List of Food Plants of some Malayan Insects, 1920—1925" is in the press and will put on record all the identified insects which have been received during that period. The insects and host plants in the present report conform to that list to which reference should be made.

Fruit.

(a) Hemiptera.

1. *Pulvinaria psidii*, Mask.

This is a small pale greenish coloured scale-insect which has been noted on the leaves of oranges and other citrus plants. The leaves of citrus plants are frequently covered with a black mould, which is merely a fungus growing on the secretions of small insects, and causes very slight injury to the plant. Spraying with a suitable contact spray or fumigating the trees would eventually rid them of this fungus by killing the responsible insects.

(b) Lepidoptera.

2. *Tinea sartoria*, Meyr.

The brown discolouration of banana skins is sometimes due to the attacks of the case-bearing caterpillars of this small moth. The discolouration is usually more marked towards the distal end of the fruit.

3. *Phyllocnistis citrella*, Staint.

The caterpillars, which are almost legless, small and greenish in colour, mine between the upper and lower surfaces of the leaves of citrus plants, their presence being rendered conspicuous by the leaves showing silvery, wavy markings. The pupal stage lasts about 6 days. This insect is of considerable economic importance to young trees and few citrus plants are found which do not exhibit some signs of injury. Hand-picking and destroying the leaves or squeezing the caterpillars or pupae in the mines, may be recommended where citrus is grown on a small scale, but where grown commercially, fumigation of attacked trees will have to be considered. A minute chalcid parasite has been observed, but up to the present only in small numbers.

4. *Psorosticha zizyphi*, Staint.

The caterpillars of this small moth are responsible for some damage to the leaves of orange trees, the younger ones being especially liable to attack, while the older leaves when attacked are folded. The caterpillars, which are yellowish-green in colour and about $\frac{1}{4}''$ in length, pupate in whitish coloured cocoons in the folded leaves. The pupal period lasts about 5 days.

This is not as a rule a very serious pest, but occasionally has caused considerable damage. Hand-picking or spraying the leaves should be done. This insect has previously been recorded on limes.

5. *Idiophantis chiridota*, Meyr.

The fruits of *Eugenia malaccensis* (Malay apple) and *Eugenia jambos*, (rose apple) have been previously recorded to be bored by the caterpillars of this small gelechiid moth. This year this insect has been reared from galls on durian leaves.

6. *Aetholix flavibasalis*, Guen.

The caterpillars of this pyralid moth have occasionally been found eating the leaves of *Eugenia jambos* (rose apple) and mangosteen. They roll the leaves of the plants and pupate inside. The pupal period lasts about 9 days The caterpillars are dark-brown in colour and when full-grown are about 1" in length.

7. *Trabala irrorata*, Moore.

The caterpillars of this lasiocampid have been recorded on the leaves of *Eugenia aquea* on two occasions during the year, but have not caused any serious damage. The caterpillar, which is about $1\frac{3}{4}$" in length, is greenish-brown dorsally and whitish ventrally. The head, and the thoracic and abdominal legs, are pinkish in colour. The body is covered with fine brown hairs and a pair of long tufts of hair arises from the first abdominal segment.

8. *Attacus atlas*, L.

This large moth, with its reddish-brown coloured wings and body, is well known in Malaya as it is frequently found at night attracted to the light in bungalows, but few realize that its caterpillars cause considerable damage to the leaves of various fruit and other trees. This year's records show that the caterpillars have been responsible for defoliating guava, soursop and *Dillenia meliosmaefolia*. Previously the caterpillars have been reported damaging the leaves of orange, ylang-ylang, Java almond (*Canarium commune*), lime, gambier, Chinese tallow tree (*Stillingia sebifera*), camphor, *Brucea sumatrana*, *Vitex trifolia*, cinnamon and China wood-oil (*Aleurites montana*).

The eggs are red in colour and very conspicuous on the leaves of the plants. They hatch in about 7 days. The young caterpillar is light green in colour and its body has the appearance of being covered with a white waxy powder. Large fleshy spines arise from various parts of the body. The caterpillar, measuring in some cases at least 5" in length, is full grown in about 29 days, when it spins a cocoon composed of dirty white to drab coloured silk The cocoons are generally found on the under-surface and occupy the whole area of the leaves. The pupal stage lasts about 25 days when the moths emerge and may frequently be seen hanging to the old cocoons until such time as their

wings have hardened sufficiently to enable them to fly. It is worthy of note that the eggs of this moth have frequently been found to be parasitised, but that the larvae rarely suffer from the attacks of parasitic enemies. Since all the stages are so readily seen, this insect should not be allowed to become a serious menace to fruit and other trees if interest in the growth of the plants is taken.

9. *Euproctis obscura*, Moore.

Specimens of the caterpillars of this moth, feeding gregariously, have been collected from the leaves of the Bengal almond. The pupal stage lasts about 6—7 days. The male and female of this species were described by Moore in the Catalogue of the Lep. Het. in the Collection of the East India Co., Vol. 2, page 351, as two separate species—*linta* and *obscura*. The name of the male is here retained.

10. *Papilio polytes*, L., *Papilio demoleus*, L. and *Papilio memnon*, L.

The eggs of these butterflies are laid on the leaves of oranges, limes, pomeloes and probably all citrus plants. The caterpillars are at first black to dark brown with conspicuous white bands, and in this stage have the appearance of birds' droppings. As they increase in size the colour changes to green with black or white markings. Full grown, they are about $1\frac{3}{4}$″ in length and are fairly inconspicuous on the leaves. Pupation takes place on the host-plant and the pupa is attached to the plant by its anal extremity and by a girdle around its body. The following average figures have been obtained for the life-cycle of *Papilio memnon*:—Egg stage 5, larval stage 16, and pupal stage 9 days, making a total of 30 days for a complete cycle.

These caterpillars, especially those of *Papilio polytes*, have caused very serious damage to the leaves of citrus plants but, as they are readily seen on the leaves when young, they should never reach serious proportions. On a small scale, the caterpillars may be hand-picked but if the area of fruit trees is large, spraying would have to be undertaken.

11. *Papilio agamemnon*, L.

The caterpillar of this butterfly is typical of the papilios, and is broadest at the mid-thoracic region. In colour it is dull-green, with darker green markings meeting on the mid-dorsal line, and when full-grown is about $1\frac{1}{2}$″ in length. The caterpillars are frequently found in small numbers on soursop, *Michelia longifolia* and *M. champaca*.

(c) COLEOPTERA.

12. *Rhytidodera simulans*, White.

A very important cerambycid pest of mangoes, the larvae tunnelling the branches in every direction. When full-grown, the larva is about 2″ in length, and prior to pupating makes a hole near the surface of the branch to allow the adult beetle to emerge.

Mango trees throughout Malaya are frequently seen with dead or dying branches and with dead branches on the ground in their immediate vicinity. This is the result of attacks by the grubs of this beetle. The first step in control is to cut off all attacked branches and to burn them, together with accumulations on the ground.

13. *Hypomeces squamosus*, F.

This is a yellowish-green or greyish looking weevil about 1″ in length, and has during the year been recorded damaging the leaves of mango. It is very common in Malaya on a wide variety of plants, and occasionally does appreciable injury, especially to kapok. It has been previously recorded feeding on the leaves of lime, rubber, jack fruit, Bonavist bean, cotton, kapok, sapodilla, cacao, Indian laburnam, gutta-percha, *Mallotus cochinchinensis* and *Pterocarpus indicus*.

14. *Odoiporus longicollis*, Oliv. and *Cosmopolites sordidus*, Germ.

The grubs of both these weevils have been found tunnelling the lower portions of stems of bananas. The larvae are typical weevil grubs, being wrinkled and footless and dirty white in colour. Full-grown they are about ¾″ in length. Pupation takes place in a cocoon made of fibres. Neither appears to be of serious importance in Malaya at the moment, so that little attention has been paid to control, but dead or dying plants are invariably allowed to remain, thereby providing suitable media for breeding. Care should be exercised in destroying all stumps of bananas, and the new suckers before they are planted should be inspected, and if found infested destroyed.

(d) DIPTERA.

15. *Chaetodacus ferrugineus*, F.

During the year the maggots of this fruit fly have been recorded attacking the fruits of the orange, mango, sapodilla, banana and papaya, and it is probably the chief pest of fruits and possibly the limiting factor to the successful growing of fruit in Malaya on a commercial

scale. Other fruits from which this insect has been recorded in Malaya are limes, cotton bolls, rose apple, loofah and egg-plant. With so great a number of alternative host-plants, and there are undoubtedly more, the control of this insect presents great difficulties. At the present time, recommendations to practise clean cultivation, i.e. the destruction of all fallen and attacked fruit, would appear to assist in the control of this insect, but to be successful, attention would have to be given to wild fruits in the near vicinity. Although poison baits have proved moderately successful in other countries against the Mediterranean fruit-fly (*Ceratitis capitata*), considerable experimental work will have to be done in Malaya to find effective control measures. On a small scale, covering the fruit to prevent this fly laying its eggs has proved satisfactory.

The eggs are laid by the female fly inserting her ovipositor just under the skin of the fruit. The eggs hatch out in about 5 days and the maggots feed on the pulp of the fruit for about 16—18 days, when they generally leave the fruit and pupate in the soil: the pupal stage lasts about 7—9 days, when the adult flies emerge to continue their work of destruction. Parasites, although one or two have been recorded, appear to be practically absent.

16. *Drosophila ampelophila*, L.

This small fly is a most common household insect and is always to be seen flying around ripe fruit. It lays its eggs on injured, ripe, or rotten, but not on unripe fruit. The eggs are very small and whitish in colour. They hatch in about one day and the maggots immediately find their way through the soft skin into the pulp, where they feed for about 4—5 days before pupation, emerging as flies in about 4 days. Since this insect only attacks ripe or damaged fruit, protection need only be afforded to ripe and cut fruit by a covering of fine muslin or similar material.

Fibres.

(a) Lepidoptera.

17. *Sylepta derogata*, F.

During the year the larva of this moth has been recorded on several occasions and is by far the most common caterpillar found injuring the leaves of cotton in Malaya. Other host plants are ochra and hibiscus flowering plants of all varieties.

The eggs, which are pale yellow in colour and laid in batches on the leaves, generally on the under surface, hatch in about 3 days to greenish-coloured caterpillars sparsely covered with hairs. They live in the folded leaves, thus rendering their presence conspicuous. When they are full-grown, which occurs in about 15 days, they are about 1″ in length and pupate inside the folded leaves. The pupa is brownish in colour and the moth emerges in about 7 days. The total life-cycle occupies on an average 25 days. The first essential in the control of this pest is prevention, and alternative food plants should not be grown in the vicinity of cotton. The rolled leaves are conspicuous and should be hand-picked and destroyed.

18. *Clania variegata*, Snell.

The caterpillars, which have been found feeding upon the leaves of kapok and other plants, are enclosed in a case composed of silk over which small twigs and other material are laid. Pupation takes place inside the case. The male is winged but the female is wingless and never leaves the case.

19. *Anomis flava*, F.

The caterpillars of this noctuid moth have been seen damaging the leaves of roselle, but have never been noticed to cause sufficient injury to warrant control measures. The caterpillars have 4 instead of the usual 5 pairs of prolegs, and when full-grown are about 2″ in length. They pupate on the leaves and the pupal stage lasts about 7 days. Besides roselle, this insect has been recorded from cotton and various hibiscus plants.

(b) Coleoptera.

20. *Nisotra (?) gemella*, Er.

This chrysomelid beetle, which is about ¼″ in length with green metallic coloured wing-covers and a reddish head and prothorax, is generally associated with roselle, but has been recorded doing serious damage to the leaves of kapok during the year. Small holes in the leaves reveal the

presence of this beetle, and spraying with a poison spray has had to be resorted to to control it.

21. *Anomala cupripes*, Hope.

This beetle is well-known in Malaya, frequently flying into bungalows at night, and is recognised by its greenish, metallic lustre. It has been recorded feeding on the leaves of roselle, and injuring to a slight extent the leaves of *Aleurites montana*. The grubs of this beetle live in the ground and feed on the roots of maize and other plants.

Insecticides.

22. *Sinoxylon anale*, Lesne,* *Dinoderus bifoveolatus*, Woll, *Hypothenemus eruditus*, Westw. and *Tribolcum castaneum*, Herbst.

These four beetles (Nos. 2337, 2338, 2341, 2336) have now been identified. The first two are bostrichids, the third a scolytid and the last a tenebrionid. Of the insects recorded from stored derris roots, *Sinoxylon anale* is by far the most important. Where derris is grown on a commercial scale and stored for any length of time, the question of fumigation and storing the roots in air-tight receptacles will have to be considered, since they have been seen on several occasions to be seriously affected, and on one occasion during the year, a whole crop was lost during storage. Instances have also occurred of consigments of derris root exported from Malaya being seriously damaged by this insect on arrival at their destination.

* Investigations on "Tuba". M. A. J. Vol VIII, No. 10. October, 1925.

Oils and Fats.

(a) Lepidoptera.

23. *Batrachedra arenosella*, Walk.*

The caterpillars of this small moth feed on the male and female flowers inside the unopened coconut spike. Numerous enquiries have been received concerning this insect, but observations show that the direct injury caused by it is negligible.

24. *Antigastra catalaunalis*, Dup.

This moth lays its eggs singly on the leaves of gingelly. The full-grown caterpillars are about ¾″ in length, green in colour and sparsely covered with hair. The newly-emerged caterpillar eats holes in the leaf, but later webs together the top shoots and bores into the shoots and pods. The pupal period lasts about 7 days. The shoots containing the caterpillars are best removed and burnt. The moths are said to come freely to light and light traps may prove successful. At the Government Experimental Plantation, Serdang, this insect has caused considerable injury.

25. *Tirathaba*, sp. nr. *trichogramma*, Meyr.

Information concerning the status of the caterpillars of the "greater coconut spike" moth has been asked for on several occasions, and experiments are being conducted to find out if its control by spraying and opening up the spikes is a sound economic practice. Spraying with lead arsenate has proved successful, but at present the number of times that this operation should be carried out is exercising the attention of this Division. The larvae, which may be found attacking both the female and male flowers, are slate-brown in colour, sparsely covered with hair and about 1¼″ in length when full-grown. They have the habit of wriggling when disturbed, and under the cover of their silken runs retreat or advance rapidly. On some estates, there is little doubt that spraying the spikes as soon as they have opened would be compensated for by a greater return of coconuts. The practice which has been followed with dwarf coconuts is to open up the spikes when they show signs of splitting and to spray them immediately, before the moth lays its eggs. Pupation takes place practically anywhere on the spikes and frequently amongst the fallen male flowers at the base.

26. *Parasa herbifera*, Walk.

The slug-like, greenish caterpillars of this limacodid moth, have four regular rows of tufts of hairs, and a black

* M. A. J. 1924. Vol. XII. No. 5. "*Batrachedra arenosella*, Wlk. in relation to the Nut-fall of Coconuts."

patch immediately behind the head and on the anal segment. They live gregariously on the leaves of *Aleurites montana*, castor and ylang-ylang, and in a glass breeding cage a "follow your leader" procession in every direction is frequently observed. They attain a length of about 1" and pupate on the leaves in round cocoons. The pupal period lasts about 14 days.

27. *Setora nitens*, Walk.

Young coconut palms especially have been seriously damaged by the caterpillars of this limacodid moth, which when full-grown are about 1¼" in length. They may be either green or brick red in colour, with bluish and brown markings and tufts of poisonous hair. This moth is a pest of young palms, especially in newly-planted areas, and its larvae are rarely found in large numbers on palms over 6 years of age. Spraying has been successfully carried out, but in less serious outbreaks collecting the caterpillars has been undertaken. The caterpillars are usually very highly parasitised. Other host plants are the African oil and nipah palms. When the caterpillars are full-grown, they pupate in round brownish-coloured cocoons, several of which are frequently seen congregated together at the mid-rib of the leaf. The pupal period lasts on an average 22 days.

28. *Artona catoxantha*, Hamps.*

This is probably the most serious pest of coconut palms in Malaya, although outbreaks have only been reported on three occasions during the year; once at Kuala Dipang, at Batu Gajah and near Teluk Anson, the latter after it was all over. Parasites—the chief of which is the Tachinid, *Ptychomyia remota*—play a most important rôle in the control of this insect, and during the year the importation of this parasite into Fiji for the control of a closely related pest, *Levuana iridescens*, was successful.

29. *Attacus cynthia*, Dru.

This is the wild equivalent of *Attacus ricini*, Boisd. the Eri-silk worm of India. The caterpillars are generally yellowish in colour with conspicuous black patches on the abdominal segments, and with six longitudinal rows of fleshy spines. Full-grown the caterpillars are about 4" in length. During the year the caterpillars were found causing considerable damage to the leaves of Java almond. Previous records show that caterpillars have been collected from guava and *Glochidion leiostylum*. One dead, female moth was dissected in the laboratory and found to contain 599 eggs. All stages of this insect are easily seen on the trees, and should be hand-collected before any damage of a serious nature has occurred.

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* Malayan Agricultural Journal, Vol. XIII, No. 4.

30. *Dasychira mendosa*, Hübn.

The caterpillars of this lymantriid moth are very conspicuous when full-grown, being about 3″ in length and having a pair of brownish tufts of hair immediately behind the head. Four pairs of yellowish tufts are situated on the mid-dorsal line of the fourth, fifth, sixth and seventh segments, a pair of lateral tufts on the fourth and fifth, and one tuft towards the posterior portion of the abdomen. There are also numerous reddish protuberances carrying small tufts of hairs, and the head and legs are red in colour. During the year, the caterpillars were found doing some damage to the leaves of cinnamon; previous observations record *Aleurites montana* and ramie as host-plants. The pupal period lasts about 5 days.

31. *Porthesia scintillans*, Walk.

Caterpillars of this lymantriid moth are very common and have been found on a variety of plants, and are of considerable economic importance to the castor plant. During the year *Aleurites montana*, *Pithecolobium dulce* and cabbage have suffered injury, and this insect has been previously recorded on ochra, rubber (flowers), *Sesbania aculeata*, *S. grandiflora*, vanilla, dadap, cowpea, soya beans and *Eugenia aquea*. The eggs, which are laid in groups covered with hairs, hatch in about six days to hairy yellowish-coloured caterpillars. Full-grown the latter are about 1¼″ in length, brown in colour and with a series of tufts of almost black hairs situated dorsally on the 4th, 5th, and 11th segments. Along the mid-dorsal line between the 4th and 11th abdominal segments a pale thin yellow stripe is present. The larvae are full-grown in about 28 days. The pupae are reddish-brown in colour and are found on the leaves under a thin cocoon. The pupal stage lasts about 8 days. The caterpillars are gregarious in habit, thus rendering themselves fairly conspicuous and being easily collected. If in large numbers, the plants would have to be sprayed.

32. *Amyna punctum*, F.

Croton leaves were again recorded to have been badly eaten by the larvae of this noctuid moth. The larva is a semi-looper, white to yellow in colour and about 1¼″ in length. Spraying operations were successfully undertaken, but it is essential to realise that this moth is a very important pest, and growers of croton should be prepared for trouble. The pupal stage lasts from 7—8 days.

33. *Tiracola plagiata*, Walk.

This is a well-known pest in Malaya and has been observed migrating in army formation from "blukar" (secon-

dary jungle growth) into cultivated areas, leaving places where there is an abundant supply of food for clean weeded areas, such as a clearing with newly-planted rubber. The caterpillar, which when full-grown is about 2½″ in length, is dull violet-brown in colour with a red-coloured head. It is frequently found on castor and has also been recorded on sisal hemp, tapioca, banana, rubber and lime, and will probably be found to feed on most cultivated plants. The eggs are green in colour and are laid in groups spread over the surface of the leaf. The pupa, which is red in colour, is found in the ground. If the caterpillars are migrating from "blukar" to cultivated areas, trenching would have to be undertaken, but when actually feeding on cultivated crops, hand-collecting the eggs or caterpillars or spraying would have to be resorted to.

34. *Hidari thrax*, Hübn.

On several occasions during the year, damage by the caterpillars of this skipper butterfly to coconut palms has been reported, but in every case parasites were responsible for controlling this spasmodic pest. When injury to the leaves of coconuts is noticed, the caterpillar is greenish in colour with a dark violet longitudinal stripe on each side. The head is large and dark brown in colour. Full-grown the caterpillar is about 2½″ in length. The eggs are yellow in colour and hatch in about 8 days, the larval stage lasts about 35 days and the pupal stage about 9 days, giving about 7 weeks for the life cycle. The caterpillars are gregarious in habit and several are frequently found together in the folded leaflets. Besides coconuts, bamboos are sometimes attacked. It is interesting to note that this insect is not a pest of coconuts in India.

35. *Amathusia phidippus*, L.

Although not of serious importance, occasional caterpillars of this butterfly have been found feeding upon the leaves of coconut, banana and African oil-palm. They are somewhat greenish-brown in colour with tufts of hair arising from the head and anal segment, and are thickly covered with fine long hairs. They attain a length of over 3″ and pupate on the leaves. The pupal period lasts about 10 days.

36. *Elymnias hypermnestra*, L.

The full-grown caterpillar is about 2″ in length with a small yellow head surmounted by two erect pink pubescent processes: the anal segment carries two similar processes. Its colour is green with yellowish and reddish spots and with longitudinal yellow lines. The pupa, which is attached to the leaf by its anal segment, is green in colour

with yellow streaks bordered by reddish coloured streaks or spots. Damage to the leaves of coconuts, areca and other palms is occasionally done.

(b) Coleoptera.

37. *Plesispa reichei*, Chap.*

Trouble on some estates have been caused by both beetles and grubs feeding on the leaves of young coconut palms. The beetles are recognised by the black wing-covers and yellow head and prothorax: the grubs, which are yellowish in colour and about $\frac{1}{2}$" in length, have lateral projections. Before transplanting from the nursery to the field, the seedling palms should be immersed in a solution of lead arsenate. This hispid beetle has also been found on the nipah palm.

38. *The Clove Cerambycid.*

The grubs of a large cerambycid beetle, allied to the genus *Callichroma*, are responsible for boring the branches and trunks of cloves. Unpublished records show that the complete life-cycle from egg to adult takes about a year, the adult beetles emerging in March and April. The results of experiments indicate that this pest can be controlled by injecting ortho-dichlorobenzene into the borings of the grubs, and up to the present, no injury to the tree has been observed by the use of this substance.

39. *Diocalandra frumenti*, F.

Specimens of this weevil have been received for identification with enquiries concerning its importance to the coconut palm. Numerous observations have been made, and in every case this weevil with its grubs have been associated with previous decay, especially where the petioles have been broken off. The weevil is about $\frac{1}{4}$" in length, and on each of the two wing-covers, there are two black and two yellowish-brown spots.

(c) Diptera.

40. *Agromyza* sp. prob. *sojae*, Zehnt.

Maggots of this small fly have caused considerable damage to soya bean and appear to be a limiting factor in some situations to the successful cultivation of this crop. Indications are not wanting showing that susceptibility to attack varies with the variety. Attacks are not confined to soya bean, damage having been recorded in Malaya to both cowhage and french beans. The fly lays its eggs in small cracks in the epidermis of the stems of the seedlings, and the maggots feed in the stems. The small brown pupae are easily found and the flies emerge from them in about 8 days.

*Agricultural Bulletin, No. 34 The two-coloured coconut leaf beetle.

Cover Crops.

(a) Lepidoptera.

41. *Lamprosema diemenalis*, Guen.

The caterpillars of this pyralid moth have been recorded during the year on the cover crops *Tephrosia candida*, *Calopogonium mucunoides*, *Pueraria Thunbergiana*, pigeon pea, *Centrosema Plumieri*, and *Clitoria cajanifolia*, and will probably be found on all cover crops belonging to the family Leguminosae, in so far as they have also been collected in Malaya from *Derris* spp., cowpea, horse gram, soya bean, groundnut and indigo. The caterpillars roll the leaves and feed on the epidermis. In colour, they are greyish-green with a yellowish head, and when full-grown are about ¾″ in length. Pupation takes place on the leaf and the pupal period lasts from 6—8 days. This insect is generally distributed on cover crops, occasionally causing considerable damage and preventing the establishment of the cover. In the majority of recorded instances of injury, however, the caterpillars have been found to be fairly highly parasitised.

42. *Utetheisa pulchella*, L.

The caterpillars of this moth were alleged to be causing considerable damage to *Crotalaria usaramoensis*, but no specimens of the larvae were received. It is, however, a well-known pest, and is a serious one to sann hemp in India. The caterpillars are about ¾″ in length with a few scattered blackish hairs arising singly from warts, and reddish-orange blotches are conspicuous on each side of the folded leaves and the life-history lasts about 4 weeks.

(b) Coleoptera.

43. *Araecerus fasciculatus*, de Geer.

This beetle, which is only about 4 mm. in length, is responsible for the destruction of seeds of various crops, and in some instances, no seed has been obtained owing to its depredations. The insect, which might have two distinct biological races, is also a pest of stored products. It has been recorded in Malaya attacking the young shoots of the avocado pear, rubber-seed cake, stored areca nuts, egg-plant fruits and brazil nuts, and the seeds of *Tephrosia candida*, kapok, cassie, soya bean, cotton and *Crotalaria saltiana*.

Vegetables.

(a) Lepidoptera.

44. *Hellula undalis*, F.

The leaves and shoots of cabbages and radishes have been damaged by the caterpillars of this pyralid moth, which are sometimes very destructive. The eggs, which hatch in about 4 days, are generally laid on the under-surface of the leaves. At first, the larvae mine the leaves, but later make covered runs of silk and other material on the leaves and stems, finally boring into the latter. The larval stage lasts about 12 days, and the pupa may be found in the larval burrow or on any part of the plant. The pupal period lasts about 7 days. The caterpillar, when full-grown, is about ½″ in length and varies in colour, being frequently yellowish or pinkish-white with brownish stripes.

45. *Leucinodes orbonalis*, Guen.

Frequently the shoots and fruits of egg-plant are seen to be bored by the pinkish coloured caterpillars of this pyralid moth, which are about ¾″ in length, and cause considerable injury at times. Pupation, which lasts about 8 days, takes place on the plant. To control this pest all affected fruits and shoots should be collected and burnt. The caterpillars have been found to be parasitised by a tachinid fly, *Pachyophthalmus* sp.

46. *Acherontia styx*, Westw.

Another fairly common caterpillar on egg-plant is the larva of this hawk moth. It has also been recorded during the year on *Datura metel*. The eggs are at first greenish, and later orange, in colour. The caterpillars, which feed on the leaves, are somewhat inconspicuous. They are light green in colour, with darker green oblique stripes, and carry a recurved "horn" at their anal end. They attain a length of about 3½″ and enter the ground for pupation. The egg stage lasts about 5 days and the larval stage about 21 days and from the entrance into the soil until the emergence of the moth 18 days elapse. When the leaves are seen to be eaten a search should be made for the caterpillars, which are easily collected and destroyed.

47. *Theretra nessus*, Dru.

Occasional caterpillars of this hawk moth have been collected feeding on the leaves of yam, but have not been of serious importance. When full-grown, the larvae are about 3½″ in length and green-blue in colour, with the "horn" yellow. Pupation takes place in the soil and the pupal stage lasts about 17 days.

48. *Prodenia litura*, F.

This is one of the most commonly collected noctuid pests, since the caterpillars have a wide range of food plants and will probably attack any low-growing plant. Tobacco, cabbage, cowpea, tomato, castor, hibiscus, bambarra, groundnut and other plants have from time to time suffered severely.

The eggs, which are laid in clusters on the leaves and are covered with buff-coloured hairs, hatch in about four days. The caterpillars at first are blackish-green in colour and live gregariously on the host plant, but after a few days separate to feed on different portions. They are full-grown in about three weeks and are then about 2″ in length, with five yellow stripes running longitudinally with two conspicuous dark-brown bands, one on the first abdominal segment and one towards the posterior extremity. Pupation takes place in the soil and the pupa is reddish-brown in colour. The moth emerges in about 7 days.

49. *Polyommatus bacticus*, L.

Besides the cowpea, the pods of *Crotalaria incana* have been found to be bored by the caterpillars of this lycaenid moth, all the seeds being thereby destroyed. The eggs are laid on the flower-buds and pods, and pupation may take place on any part of the plant. This insect will probably be found to attack the majority of pulses. The pupal period lasts about 8 days.

(b) Coleoptera.

50. *Aspidomorpha miliaris*, F.

These pretty "tortoise" beetles, with their larvae, are occasionally found feeding on the leaves of sweet potato and morning glory. The latter plant, which is frequently used round tennis courts in this country, has been known to be defoliated completely by their attacks.

The beetles, which have the appearance of small tortoises, are about ½″ in length, yellowish-brown in colour with conspicuous dark spots, and with the edges of the elytra projecting beyond the body. The eggs are laid in an egg-case composed of numerous papery partitions, each egg being closed in a pair of "leaves". The larva which hatches in about 12 days, is yellowish in colour with a dark head and with numerous dark spines arising from the sides of the body. The moulted skins and excrement of the grubs are carried by two spines at the anal segment. In about 20 days, they are full-grown, and pupate exposed on the leaves, but only the fifth larval skin is attached to the anal segment of the pupa. The pupal stage lasts about 11 days, making the total life cycle about 43 days.

All the stages of this insect are fairly conspicuous on the leaves and should be hand-collected, but should it increase to large numbers spraying will probably have to be resorted to.

51. *Cylas formicarius*, F.

Sweet potato tubers are sometimes badly injured by the grubs of this weevil. The weevil is about $\frac{1}{2}''$ in length, with a yellowish-red prothorax and dark shiny green wing-covers. The legless grub is whitish in colour and feeds inside the tubers. The whitish coloured eggs are laid in cavities made by the female weevils and pupation takes place inside the tubers.

This is a very serious pest of sweet potatoes and no successful control measure has been found, although deep-rooted varieties would appear to be less susceptible to attack.

Rice.

(a) Hemiptera.

52. *Leptocorisa* spp.

Five different species of "Pianggang" have been recorded in Malaya, but observations during the year would appear to show that the chief pest to padi is *Leptocorisa acuta*, Thunb. Considerable anxiety for the padi crops in the Kuala Pilah district was aroused, but by the combined cooperative efforts of the District Officer, Agricultural Field Officers and Malay cultivators, successful control was made possible.

Detailed work on this pest was commenced and a bulletin embodying the results of this investigation will be published in due course. *Leptocorisa varicornis* has been recorded sucking the sap from mulberry leaves.

53. *Sogata pallescens*, Dist.

A small fulgorid bug which appeared in exceptionally large numbers towards the end of the year on padi throughout Malaya. It was probably more prevalent in Province Wellesley, but in the Kuala Pilah district it was widely distributed. The cause of so great an increase is difficult to explain and the economic importance of this insect remains doubtful. The padi plants, wherever these insects were found, appeared decidedly unhealthy, and delayed planting from the nursery and excessive rains afterwards were probably primarily responsible for their appearance, or with the change to more normal climatic conditions, the padi recovered to a large extent and the insects simultaneously disappeared.

54. *Laelia suffusa*, Walk.*

The identification of this moth, which damaged padi towards the end of 1924 at Sungei Star, near Parit Buntar, has been confirmed. No further outbreaks were reported during the year.

55. *Spodoptera mauritia*, Boisd.

The eggs of this noctuid moth are laid in clusters covered by buff-coloured hairs on the under surface of leaves of grasses and padi, and hatch in about 5 days. The larvae vary in colour, during the course of their growth, but when young are distinctly green with a reddish lateral line. They are full-grown in about 21 days and enter the soil for pupa-

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M. A. J. Vol. XII, No. 11 November 1925. "A note on *Laelia suffusa*, Walk. damaging padi". M. A J. Vol. XIII, No. 3, March, 1925.

tion. Feeding generally takes place at night, the caterpillars hiding in suitable places during the day. The pupal period lasts about 7 days, making a total of about one month for the complete life-cycle. This insect frequently increases to very large numbers, causing considerable damage to nursery and other padi before it can be controlled.

56. *Chapra mathias*, F.

This was recorded from the Setapak district, causing slight damage to the leaves of padi growing in the nurseries. The larva, which is pale-greenish in colour with a whitish line running along each side, feeds in the rolled-up leaves. Although common on padi, this insect is kept in check by parasites the chief of which are the tachinid flies, *Halidaya rufa*, Bezzi and *Halidaya luteicornis*, Walk.

57. *Melanitis leda*, L.

The pale-green caterpillars, with a pair of projections from the dark head and anal segment, were reported to have caused slight damage to padi in nursery beds near Setapak. Occasional caterpillars and pupae, which are suspended from the leaves by their anal extremity, may be found in most padi areas, but probably owing to the attacks of parasites, little injury is caused.

Rubber.

(a) Isoptera.

58. *Coptotermes gestroi,* Wasm.

The control of "white ants" on some rubber estates by the use of mercuric chloride, if enquiries as to the method of its application is any guide to the extent of its employment, seems to have replaced the generally accepted measure of clean-clearing. It should be mentioned that such a procedure means a continuous examination of the trees with renewed applications of the chemical, and is only recommended when clean-clearing and the removal of the habitations of these insects are impossible.

(b) Lepidoptera.

59. *Acanthopsyche snelleni,* Heyl.

These "case-worms" have frequently been observed on the tapping surface of rubber, causing a certain amount of damage. Painting or spraying the surface with lead arsenate has proved an effective measure of control, but where treatment for "mouldy rot" is carried out, no further measures are necessary.

60. *Homodes brachteigutta,* Hamps.

A noctuid caterpillar, with spatulate hairs resembling two "karingas" or red ants (*Oecophylla smaragdina*) joined together, has been recorded, on a number of occasions slightly injuring the tapping surface of rubber. This caterpillar has been known for sometime, but only comparatively recently was success obtained in breeding it out. It would appear to be confined to certain localities and most enquiries have been received from the district of Malacca.

(c) Coleoptera.

61. *Crossotarsus wallacei,* Thom.

This brownish-black robust beetle which is about $\frac{5}{8}$" in length, has, on numerous occasions, been found associated with unhealthy rubber trees.

62. *Platypus cupulatus,* Chap.

This beetle, and *Platypus lepidus,* Chap., are frequently found boring injured and diseased rubber trees, and stumps. They are both brownish in colour and about $\frac{1}{4}$" in length. Under certain conditions, they seem to be able to penetrate rubber trees from which latex still flows.

Ornamental and Miscellaneous Plants.

(a) Hemiptera.

63. *Phenacoccus iceryoides*, Green.

This coccid bug caused considerable damage to rain trees in Singapore and was shortly afterwards recorded from Ipoh. Eight other food plants have been recorded in Malaya.

(b) Lepidoptera.

64. *Caprinia conchylais*, Guen.

The African rubber tree (*Funtumia elastica*) has been noted to be attacked by the caterpillars of this pyralid moth on numerous occasions. They have also been recorded from the India rubber tree (*Ficus elastica*).

65. *Cephonodes hylas*, L.

This insect was responsible for considerable damage to coffee when it was grown on a large scale in Malaya, and the caterpillars of this hawk moth are frequently found feeding on the leaves of cape jasmine (*Gardenia jasminoides*).

66. *Erionota thrax*, L.

Caterpillars of this butterfly, which are often injurious to banana by rolling and feeding on portions of the leaves have been recorded damaging the leaves of a species of *Caryota*. Other host plants are manila hemp and nipah palm.

67. *Gangara thyrsis*, F.

A pest of the coconut palm in India, but not yet recorded on that palm in Malaya where it has been found on royal and other ornamental palms. The caterpillar has a pinkish tinge, but is essentially recognised by the long white waxy filaments arising from the body.

68. *Terias hecabe*, L. and *Terias blanda*, Boisd.

Caterpillars of these pierid butterflies are common on *Pithecolobium* spp.. *Terias hecabe* is frequently seen settling in swarms, especially on roads in damp localities.

(c) Hymenoptera.

69. *Arge xanthogastra*, Cram.

A sawfly which lays its eggs in incisions in the stems of roses. The larvae are distinguished from ordinary cater-

pillars by having six pairs of prolegs instead of five. The pupal period lasts about 7 days.

(d) Coleoptera.

70. *Plesispa nipa*, Maul.

This hispid beetle, which is similar in appearance to *Plesispa reichei*, but has a reddish coloured prothorax, has been recorded during the year from nipah, sago and nibong (*Oncosperma filamentosa*) palms. Both grubs and adults feed between the unopened pinnae of the leaves.

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INDEX.

(The numbers refer to paragraphs not to pages).

Acacia, *v.* Cassie.
African oil-palm 27, 35
African rubber *v. Funtumia.*
Aleurites 8, 21, 26, 30, 31
Areca palm 36, 43
Avocado pear 43
Banana 2, 14, 15, 33, 35, 66
Bambarra *v.* groundnut
Bamboo 34
Bean, Bonavist 13
Bean, French 40
Bean, Soya 31, 40, 41, 43
Bengal almond 9
Brazil nut 43
Brinjal *v.* egg-plant.
Brucea 8
Cabbage 31, 44, 48
Cacao 13
Calopogonium, 41
Camphor 8
Canangium v. Ylang-Ylang.
Canarium v. Java Almond.
Cape jasmine, *v. Gardenia.*
Caryota 66
Cassie 43
Castor 26, 31, 33, 48
Centrosema 41
Chiku *v.* sapodilla.
China wood-oil *v. Aleurites.*
Chinese tallow tree 8
Cinnamon 8, 30
Citrus 1, 3, 4, 8, 10, 13, 15, 33
Clitoria 41
Clove 38
Coconut 23, 25, 27, 28, 34—37, 39
Coffee 65
Cotton 13, 15, 17, 19, 43
Cowhage 40
Cowpea 31, 41, 48, 49
Crotalaria 42, 43, 49
Croton 32
Dadap 31
Datura 46
Derris 22, 41
Dillenia 8
Egg-plant 15, 43, 45, 46
Enterolobium 63
Erythrina v. dadap.
Eugenia 5, 6, 7, 15, 31
Ficus 64
Funtumia 64
Gambier 8
Gardenia 65
Gingelly 24
Glochidion 29
Gram, horse 41
Groundnut 41
Groundnut, bambarra 48
Guava 8, 29
Gutta-percha 13
Hemp, Manila 66
Hemp, sisal 33
Hibiscus, ornamental 17, 19, 48
India Rubber tree *v. Ficus.*
Indigo 41
Jack fruit 13
Java almond 8, 29
Kapok 13, 18, 20, 43
Laburnam, Indian 13
Ladies' fingers *v.* ochra.
Lime *v. Citrus.*
Loofah 15
Maize 21
Malay apple *v. Eugenia.*
Mallotus 13
Mango 12, 13, 15
Mangosteen 6
Michelia 11
Morning glory 50
Mucuna v. cowhage.
Mulberry 52
Nibong *v. Oncosperma.*
Ochra 17, 31
Oncosperma 70
Orange *v. Citrus.*
Orcodoxa, *v.* Royal palm.
Padi *v.* rice.
Papaya 15
Pea, Pigeon 41
Pithecolobium 31, 68
Pomelo *v. Citrus.*
Pterocarpus 13
Pueraria 41
Radish 44
Raintree *v. Enterolobium.*
Ramie 30

Rice 52—57
Rose 69
Rose apple *v. Eugenia*
Roselle 19—21
Royal palm 67
Rubber 13, 31, 33, 43, 58—62
Sago 70
Sapodilla 13, 15
Sesbania 31
Shoe-flower *v.* Hibiscus.
Sisal, *v.* hemp.
Solanum v. egg-plant.
Soursop 8, 11
Soya *v.* bean.
Stillingia 8
Sweet potato 50, 51
Tapioca 33
Tephrosia 41, 43
Terminalia v. Bengal almond.
Tobacco 48
Tomato 48
Tuba *v. Derris.*
Vanilla 31
Vigna v. cowpea.
Vitex 8
Voandzeia v. groundnut bambarra.
Water plam *v.* Nipah
Ylang—Ylang 8, 26
Yam 47

NOTES ON CONDIMENTS USED IN CURRIES.

J. N. Milsum.

Large quantities of condiments are consumed, supplementary to rice, by Asiatics in the Malay Peninsula. These, with few exceptions are imported from India and elsewhere and form an appreciable item in the food requirements of Indian labourers in this country. The total quantity of curry-stuffs imported into the Peninsula during the year 1924 is given as 75,738 cwts. valued at $1,410,685. About 20 per cent. of this amount, however, is shown as re-exported. It is to be appreciated that the imports for the present year are likely to show a substantial increase, over those of 1924, owing to the considerably larger labour requirements of the Peninsula and the general local prosperity.

It is not proposed in these notes to enumerate all the condiments and similar articles consumed by Asiatics in Malaya. Certain of these, as for example, gambier, are already produced to a considerable extent in this country. Such articles of commerce as cloves, nutmegs, mace and the various peppers, frequently eaten by Asiatics are also grown to a certain extent and are well known. A number of the less important ingredients in curries, seen at times in Indian shops, have as yet not been identified with certainty.

The following list shows those condiments commonly used and offered for sale in almost every food-stuff shop throughout the country:—

Common Condiments.

Name.	Latin Name.	Tamil Name.	Malay Name.
Ajowan	*Carum copticum*	Omum	Jintan
Cardamon	*Elettaria Cardamomum*	Elakkai	Buah Pelaga
Chilli	*Capsicum annuum*	Milagai	Lada merah
Cinnamon	*Cinnamonum zeylanicum*	Karuva	Kayu manis
Coriander	*Coriandrum sativum*	Kotamalli	Rempak
Cummin	*Cuminum Cyminum*	Siragam	Jintan puteh
Garlic	*Allium sativum*	Vellaipundu	Bawang „
Ginger	*Zingiber officinale*	Ingi	Haliya
Mustard	*Brassica juncea*	Kadugu	Sesawi
Onion	*Allum Cepa*	Vengayam	Bawang merah
Tamarind	*Tamarindus indica*	Pulli	Asam jawa
Turmeric	*Curcuma longa*	Mangal	Kunyit

It is possible to grow several of these crops with success here and certain of them, such as chillies, ginger and turmeric are grown on a small scale by Chinese vegetable gardeners for sale, usually in a fresh state. There

does not appear, however, any indications that their extended cultivation will be undertaken at present. There is no cultivation in this country analogous to the "chena" cropping of India and Ceylon, as with the exception of padi, the Malays do not undertake any other regular system of cultivation. Indians usually are employed as paid labourers on estates, and those Chinese who take up land and settle, usually treat food-crops purely as garden produce and rarely cultivate them on a large scale. In India, condiments are grown generally in populous districts as a rotation with other crops of major importance. The soil utilized is very fertile and yields heavy returns, enabling the cultivator to make a profit, even at the low price the wholesale dealer is prepared to pay for the majority of these crops.

Under the headings of the various crops, a few notes are appended, showing their relative importance, country of origin, and a short description of the product.

Ajowan (N.O. Umbelliferae).

A herbaceous plant cultivated in India, especially in Bengal. It is usually grown as a mixture on rich land, but is of minor importance agriculturally. The small brown seeds are offered for sale in all Indian shops, being in considerable favour as a digestive. The seeds produce ajowan-oil from which thymol, an important antiseptic, is distilled.

Cardamom (N.O. Zingiberaceae).

There are several plants belonging to the order of gingers that produce the cardamoms of commerce, but that known as the Lesser or Malabar Cardamom is of major importance and apparently the only one under cultivation.

The true plant is a perennial herb, with thick fleshy rhizomes, from which arise numerous leafy stems. The fruit is oblong, three-sided, ribbed, and pale buff-coloured when ripe. Those usually imported into this country are about half an inch long, though there is said to be considerable variation in size. The fruit is three-valved, splitting when ripe, each cell containing about six dark brown or reddish aromatic seeds, about a tenth of an inch long and noticeably wrinkled.

Cardamoms are mainly cultivated in India and Ceylon. In the former country, they are extensively grown in the hills at a considerable elevation. The crop is stated to require a heavy rainfall, partial shade and a humous soil.

Several attempts have been made to establish Cardamoms on the plains at the Experimental Plantation, Serdang, but without success. They might, however, be grown on the higher hills of the Peninsula.

This is a valuable condiment, being retailed in the local shops as high as $4/- per kati (1⅓ lbs.).

Cardamoms are used by Indians, especially the better classes, for flavouring meat in curries, the fruit being either ground up or used whole. It is also used in conjunction with "betel" as a masticatory.

Chilli (N.O. Solanaceae).

There are a number of races of capsicums cultivated, but the large-sized *Capsicum annuum* is the usual form imported into the Peninsula in a dried state. This race is cultivated by Chinese vegetable gardeners in this country. Very large quantities of chillies are grown in India, especially in Madras and in Ceylon. In the latter country, particularly in the Jaffna district, the chilli crop is extensively cultivated in rotation with tobacco, padi, tapioca and other root crops.

The imports of dried chillies into the Malay Peninsula are very large, and owing to the general absence of annual crop cultivation in this country, are likely to remain so. The Chinese grow the plant successfully here as a vegetable crop, but the fruit is seldon dried, no regular drying system being practised. Ridley states (Spices 1912, p. 369) that it is held by the natives that the locally dried capsicum has not the flavour of the dried Indian fruit and attributes this to bad drying. He remarks having seen excellent dried capsicums prepared with artificial heat by a European from fruits grown here. Chillies are certainly the most readily cultivated crop of the condiments of major importance imported into the Peninsula.

The dried chillies are ground, usually on a stone, and form the base of all curries.

Cinnamon (N.O. Laurineae).

The cinnamon of commerce is the dried bark of a small much-branched tree, about 30 feet high; but under cultivation is grown as a bush. It is a native of Ceylon and is represented in the Malay Peninsula by the closely related *Cinnamomum iners*, Bl., a common tree of the plains. The bark of *C. iners* is used by Malays, though it is considerably inferior to that of the true cinnamon. The latter tree appears to grow well on the plains in this country, though there is no record of cinnamon quills being produced. The local consumption is not large and Ceylon, Java and the Seychelles supply the general demand.

The quills are broken up and added to meat curries for their flavouring properties. They are also used by the better classes of Indians for flavouring cakes and for chewing with "betel".

Coriander (N. O. Umbelliferae).

A herbaceous annual attaining a height of 2 feet grown in Europe as a seasoning herb, and extensively cultivated in India for its seeds, which are an important ingredient in curries. The fruit is about $\frac{1}{4}$ inch long, globular, pale-yellow in colour. The ripe fruit separates disclosing the two mericarps which have a strong and peculiar flavour. This is a field rotation crop and gives heavy yeilds on rich land.

Indians use this condiment very considerably. The seeds are ground on the curry stone and invariably used in curry making.

Cummin (N.O. Umbelliferae).

A herbaceous annual, 1—2 feet high, a native of the Mediterranean region, largely cultivated in India as a garden crop. The fruits are about $\frac{1}{4}$ inch long, oblong, ridged and greyish brown in colour. Cummin seeds are much used by Indians in this country for flavouring curries. The seeds are ground with chillies on the curry stone.

Garlic (N.O. Liliaceae).

A bulbous perennial, cultivated in India and elsewhere as a garden crop for its white onion-like bulbs, which form an important article of diet and medicine for almost all Asiatics. Large quantities of the dried bulbs are imported into the Malay Peninsula from India. Chinese vegetable gardeners commonly grow Garlic as a garden crop and the fresh leaves and bulbs are much eaten as vegetables by coolies of that nationality. It appears doubtful, however, whether the dried bulbs could be produced in this country in sufficient quantity and at a price to compete with the imported crop.

Ginger (N.O. Zingiberaceae).

Ginger is grown in all tropical countries and is well-known in the Malay Peninsula, where it is cultivated to a small extent by Malays and as a garden crop by Chinese vegetable gardeners. Insufficient supplies are produced locally to meet the demand and large quantities of dried ginger are imported annually. Preserved ginger is largely prepared in South China and forms an important article of export.

The plant is a herbaceous perennial, with leafy shoots, bearing underground rhizomes, which when prepared form the dried ginger of commerce. This crop is under trial at the Experimental Plantation, Serdang, but so far poor results have been recorded. It appears to favour a well-drained humous soil, kept open by frequent cultivation.

The Chinese succeed with this crop by constant working of the soil and heavy applications of manure.

The dried roots are obtainable in all native food-stuff shops and are eaten by Indians, though to no considerable extent by the cooly class. The roots are cut into pieces and added to goat and fowl curries.

Mustard (N.O. Cruciferae).

Mustard seed is imported into this country from India, where it is fairly extensively cultivated. The plant is a small annual. The dark brown small round seeds are to be seen in all Indian food-stuff shops. Indians use a small quantity in curries, the seeds being mixed with other condiments and boiled in oil.

Onion (N.O. Liliaceae).

The small red onion is well known and commonly used by Asiatics in the dried state. Large quantities are imported into this country from India, principally from Madras The Onion is grown by Chinese vegetable gardeners in the Peninsula, mainly for sale as a fresh vegetable. They do not appear to attempt to produce the dried crop in competition with Indian produce.

Tamarind (N.O. Leguminosae).

The pulp of the fruit of the tamarind tree is pressed and preserved in large masses and imported from India into this country for sale to all classes of Indians. The tree is large and handsome with feathery foliage and soft pink flowers. The pods are from 3 to 6 inches long and contain a pleasant acid pulp. In Malaya, this tree is very slow in fruiting, probably owing to the damp climate, and is seldom planted. Fair-sized trees are sometimes seen growing around coolie lines and other places where Indians live. The fruits do not appear to be collected for preserving.

The pulp is squeezed in water and the juice added to curries, the seeds and the pulpy residue being discarded.

Turmeric (N.O. Zingiberaceae).

A perennial herb with a tuft of leaves about 2 feet high and underground rhizome, which when cleaned and dried form the turmeric of commerce. The crop is commonly grown in India, especially under irrigation, and large quantities of the dried roots are imported into this country. The local turmeric, "Kunyet" of the Malays, is considered by Ridley (Flora Mal. Pen. Vol. IX, p. 254) distinct from the Indian plant (*Curcuma longa*, Linn.) and is referred to as *C. domestica*, Valeton., native of Java. The crop is grown in certain localities by Chinese vegetable gardeners and sold in a fresh state. Comparatively little is, however,

grown in the Peninsula though the plant thrives remarkably well here. No attempt is made to produce this condiment in competition with the imports from India.

The prepared rhizomes are of an orange-yellow colour with a pleasant musky flavour. Turmeric is ground with chillies and much used in curries, causing the characteristic yellow colour. It is also used in medicine both by Malays and Indians.

The local wholesale prices (May 1926) of these condiments are approximately as follows:—Ajowan $13/-, cardamom $300/-, chilli $26/-, cinnamon $13/-, coriander $10/-, cummin $30/-, garlic $8/-, mustard $12/-, onion $9/-, tamarind $8/-, turmeric $14/- per picul respectively.

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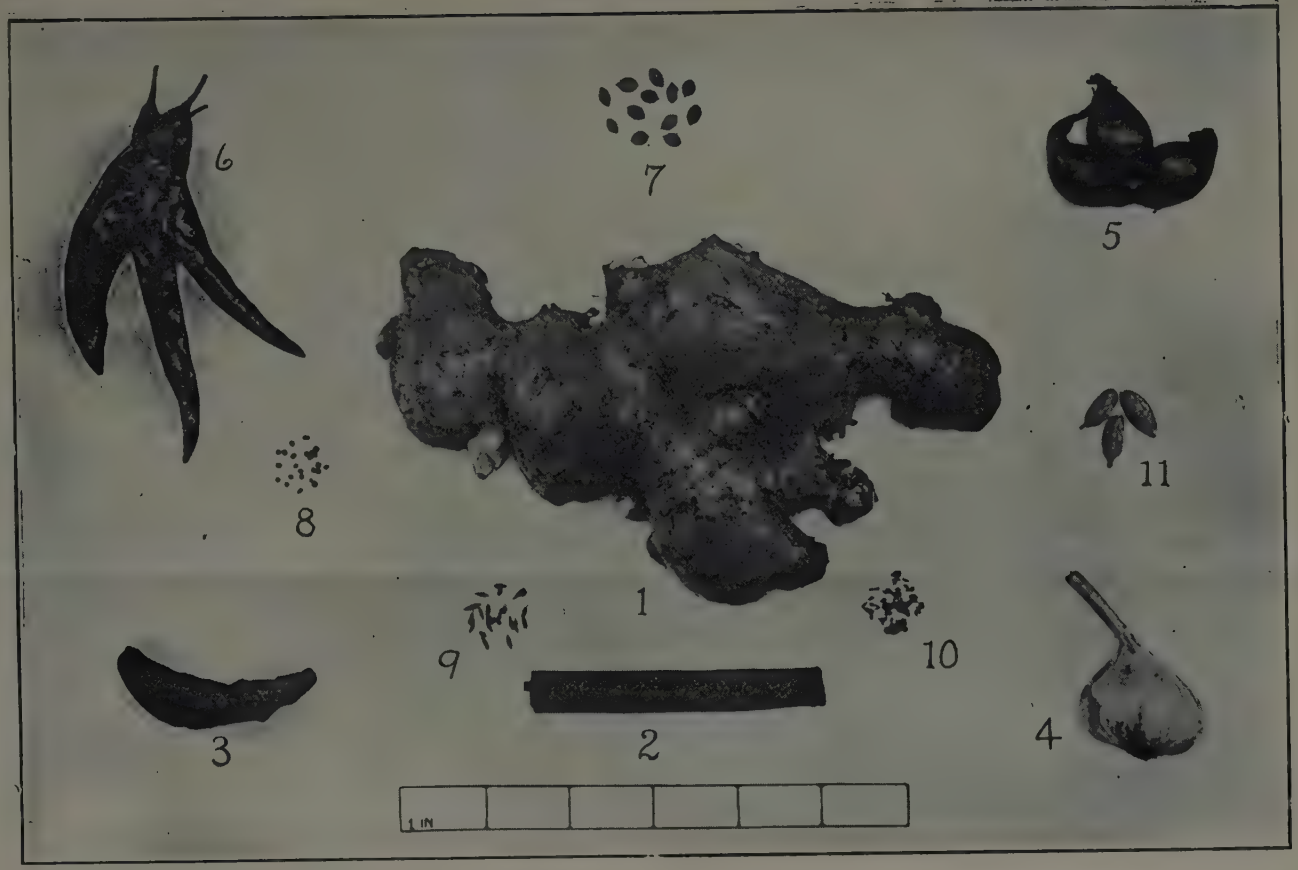

1. Ginger
2. Cinnamon
3. Cloves
4. Garlic
5. Onions
6. Red Pepper
7. Coriander
8. Mustard
9. Turmeric
10. Ajowan
11. Cardamons

TRIALS OF SELECTED PADI SEED IN PERAK NORTH

F. Birkinshaw.

The Economic Botany Division of the Agricultural Department has been instrumental in selecting padi seed to suit Krian and various other districts in Malaya, and the following notes are intended as a brief record of the value of certain selected strains in Perak North (exclusive of the Krian District).

As the selected seed has been derived from the Krian District of Perak and grown there for several years, naturally distribution has spread most in neighbouring districts, so that selected seed or its progeny is now fairly well-known in Perak North. Also the appointment of Padi Inspectors has enabled a more efficient supervision of trial plots and distribution to be maintained so that reliable figures of yields of selected and of unselected seed growing side by side have been obtained. The past season has been a very poor one generally throughout Perak North on account of the most unusual severity of the floods experienced during the growing period which resulted in a general decrease of the padi crop, and in several areas completely ruined the season's production.

In Larut District the most popular selected strains of padi are Seraup No. 36 and Seraup No. 52, which gave the following measured yields during the past season, the local padi crop adjacent being measured at the same time by the Padi Inspector in the presence of the cultivators:—

Mukim.	Locality.	Strain.	No. of plots recorded.	Average yield of padi per are in gantangs.	
				Selected.	Unselected
Tupai	Ulu Larut	Seraup 52	5	550	440
Simpang	S. Lang	,, 36	26	250	200
S. Tinggi	Kelubang	,, 36	6	600	520
Batu Kurau	Bkt. Bertam	,, 36	4	402	362
U. Selama	B. Gelugor	,, 36	1	660	540

Throughout Larut the past season was remarkable in that unusually heavy flooding occurred in nearly every padi area early in the season, followed immediately by a severe outbreak of a fulgorid bug (*Sogata pallescens*, Dist.), with the result that of over 30 localities in which trials were conducted only the above remained sufficiently undamaged to render records of yield reliable, though observations on

the crops showed that padi grown from selected seed more than held its own in comparison with crops grown from unselected seed. It is worthy of note that Seraup No. 36 suffered much less from the flooding and showed fairly definite resistance to fulgorid attack as compared with local padi in the mukims of Bukit Bertam, Jelutong and Sungei Lang; that in previous years very good stands of this strain were observed at Jebong, Simpang, Tupai, Batu Kurau and Bukit Gantang; and that Seraup No. 36 is now popular throughout the district.

In the District of Kuala Kangsar records were compiled of crop yields from several strains, the most popular being Seraup No. 1 for the heavy soils and Radin No. 13 for the harder drier lands. The following records speak for themselves: —

Mukim.	Locality.	Strain	No. of plots recorded.	Average yield of padi per acre in gantangs.	
				Selected.	Unselected.
Saiong -	Bg. Kring	Seraup 52	2	570	393
„ -	„	„ 36	1	730	393
K. Lama Kiri	Jemaan	„ 36	1	440	430
K. Buaia -	Paya Panjang	„ 1	5	390	332
„ -	Ulu Papan	„ 1	6	550	500
„ -	Ekor Papan	„ 1	2	422	320
„ -	Kg. Lembah	„ 1	7	540	500
„ -	Kg. Star	„ 1	3	561	500
„ -	Lawin	Radin 4	1	710	590
Ch. Golah -	Chumor	Seraup 36	1	500	390
Bruas -	Bruas	„ 36	1	550	360
Saiong -	Talang	Radin 13	3	433	430
„ -	„	Seraup 52	1	528	430
„ -	„	„ 48	1	520	430

Of the selected padi in this district the strain which is grown on the largest scale is Seraup No. 1. There must be several hundred acres under this strain in the mukim of Kampong Buaia alone. Cultivators were averse to giving information on the point, being afraid they would be given the trouble of providing facilities for making measurements of yield. In numerous cases where a man said he had no Seraup No. 1 padi it was found when the padi ripened that he had planted more of this strain than of any other padi. An attempt will be made next season to obtain some reliable information as to the area under this strain, and the cultivators will be told that no measurements of yield will be taken as there is no longer need for them. It is an interesting fact to record that the whole of this padi is the progeny of two gantangs of seed supplied to the Ketua of Kampong Lalang for trial in the 1921-22 season.

Though Radin No. 13 is almost confined to Talang, it has given heavy crops year after year, over 600 gantangs being recorded several times, whereas the best crops obtained by using unselected seed have rarely exceeded 430 gantangs per acre.

The organisation of trials of selected padi seed against unselected local seeds demands close and continuous attention, but good results, such as are indicated in the above notes, prove the value of this work and amply compensate for the labours which it involves; moreover, the padi cultivators appreciate the efforts made to benefit their most important industry and this in itself is encouraging.

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Publications of the Department of Agriculture.

The following publications, except those out of print, may be obtained on application to the Office of the Secretary for Agriculture; and the Malay States Information Agency, 88, Cannon Street, E.C. London.

A remittance to cover the cost should accompany applications; otherwise the Journals will be sent by post, Cash on Delivery, where that system is in force.

1. The Agricultural Bulletin F.M.S.

Vols. I—IV (1913-16) VIII & IX (1920-21) price $5.00 per volume.
Vol. V (1917) Nos. 1, 2, 3, 5 & 6 „ 250 per set.
„ VII (1919) „ 2—6 „ 450 „
(Vol. VI is out of print.)

2. The Malayan Agricultural Journal (continuing the Agricultural Bulletin) Published monthly.

Vol. X (1922) Price $5.00 per volume.
„ XI (1923) Price $5.00 per volume or 50 cents per single number.
„ XII (1924) „ „ „ „

Back numbers of Vols. I—X will not be sold singly.

3. The Handbook of Malayan Agriculture, price $1.00.

Current numbers of the Malayan Agricultural Journal and the Handbook may be purchased from the Railway Bookstalls and Branches of Messrs. The Federal Rubber Stamp Co.

4. *Special Bulletins.*

1. Notes on *Termes Gestroi* and other species of Termites found on Rubber Estates in the Federated Malay States, by H. C. Pratt, 1909, 20 cts.
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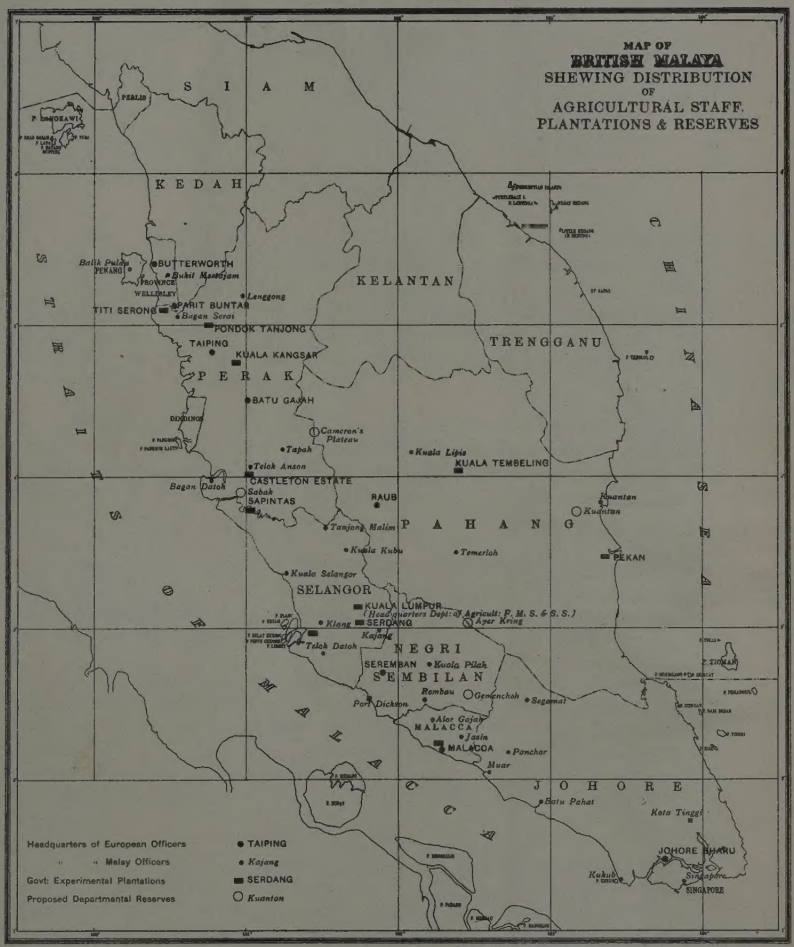

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